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# Appointment of Visit(Perspectives of Nonequilibrium Statistical Physics-The Memory of Professor Shuichi Tasaki-)

AUTHOR(S):

Saito, Keiji

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# Appointment of Visit

Department of Physics, University of Tokyo

Keiji Saito<sup>1</sup>

## 1 Exchange of E-mail with Prof. Shuichi Tasaki

It was June 2006 that I started to exchange e-mail with Prof. Shuichi Tasaki. I sent my paper on quantum fluctuation theorem in heat conduction[1] to him. I knew that he had already written a paper on the similar subject with his student[2]. My aim was to get his honest opinion on my paper. After my first e-mail, he sent me several important e-mails, and I realized how seriously he was thinking on this problem. He also sent me his presentation files on it. It was useful to understand and correct my way of thinking.

After this, he sometimes gave me seminar information in Waseda university. On the occasion of P. Gaspard's seminar, I visited Waseda university. After the seminar, we together with several other audiences moved to the nearest family restaurant to take coffees. While other people asked many questions to P. Gaspard, I could spend much time in useful conversation with Prof. Tasaki. I told him about response properties at steady state in harmonic lattices. Let  $\chi_{ij}$  be the response of  $\dot{x}_j$  against the perturbation to the position  $x_i$  at the steady state in heat conduction. Then one can exactly prove  $\chi_{ij} = \chi_{ji}$  regardless of degree of nonequilibrium, and this is the case even if we put randomness in mass configuration. He asked me if this is the case even for Toda-lattice or not, because he thought that this may be generally true in solvable models. Although it turned out that this property is only for harmonic lattices, I was deeply impressed by his quick questions and physical insight. He told me about his some ideas on thermal diode which was becoming a popular topic among heat conduction field, and some tunneling problems that he had studied before, and also some biological topics. All were very interesting and impressive.

In addition to the paper on heat conduction, I sent my next paper to him one year later, which was on the quantum fluctuation theorem in the electric conduction [3]. In his replying e-mail, he stressed on the importance of so-called two-times measurement protocol. He seems to appreciate my paper. After my paper, he wrote the mathematical paper on the quantum fluctuation theorem with the similar setup [4] and supported our results, which was unfortunately turned out to be his last paper.

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<sup>1</sup>E-mail: saito@spin.phys.s.u-tokyo.ac.jp

## 2 Appointment of Visit

After I wrote a theoretical paper on the electric conduction, I collaborated with experimentalists to demonstrate the theory [5]. At that time, I could not fully understand the effect of quantum observation. So I decided to make an appointment of visit Prof. Tasaki. I wrote several e-mails to him, but I could not receive any responses. After a while, from Ajisaka-san I could know that he was in hospital. What I wanted to discuss with him is about the relation between theoretical setup and experimental situation. I felt that there were serious gaps between them. In theories, the standard treatment was two-times measurement protocol, while experimental measurement is always continuous in time. I wanted to understand the effect of the continuous measurement. In my understanding, if we measure some observable continuously with the series of projections  $P_1 P_2 \cdots P_{N-1} P_N$ , then time-reversal measurement process  $P_N P_{N-1} \cdots P_2 P_1$  is also possible, which indicates the fluctuation theorem itself remains valid although the distribution of current is affected. I wanted to discuss this with him.

Even when he was in hospital, I asked Ajisaka-san to send other papers to him, because I (of course) expected that he would recover soon. I intended to discuss with him about all the stuffs I did not understand, immediately after his recovery. The e-mail from Ajisaka-san telling me about his death was too abrupt and sad news. I could not think of anything for a while. Eventually I could not make an appointment visit him.

His death was at the same time implies a great loss in japanese community of statistical physics. I still now remember his gentle and warmful character. May his soul rest in peace.

## References

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